METRICATION
a guide for consumers

CONSUMER RESEARCH REPORT No. 2

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A GUIDE FOR CONSUMERS

Consumer Research Report No. 2
Department of Consumer and Corporate Affairs

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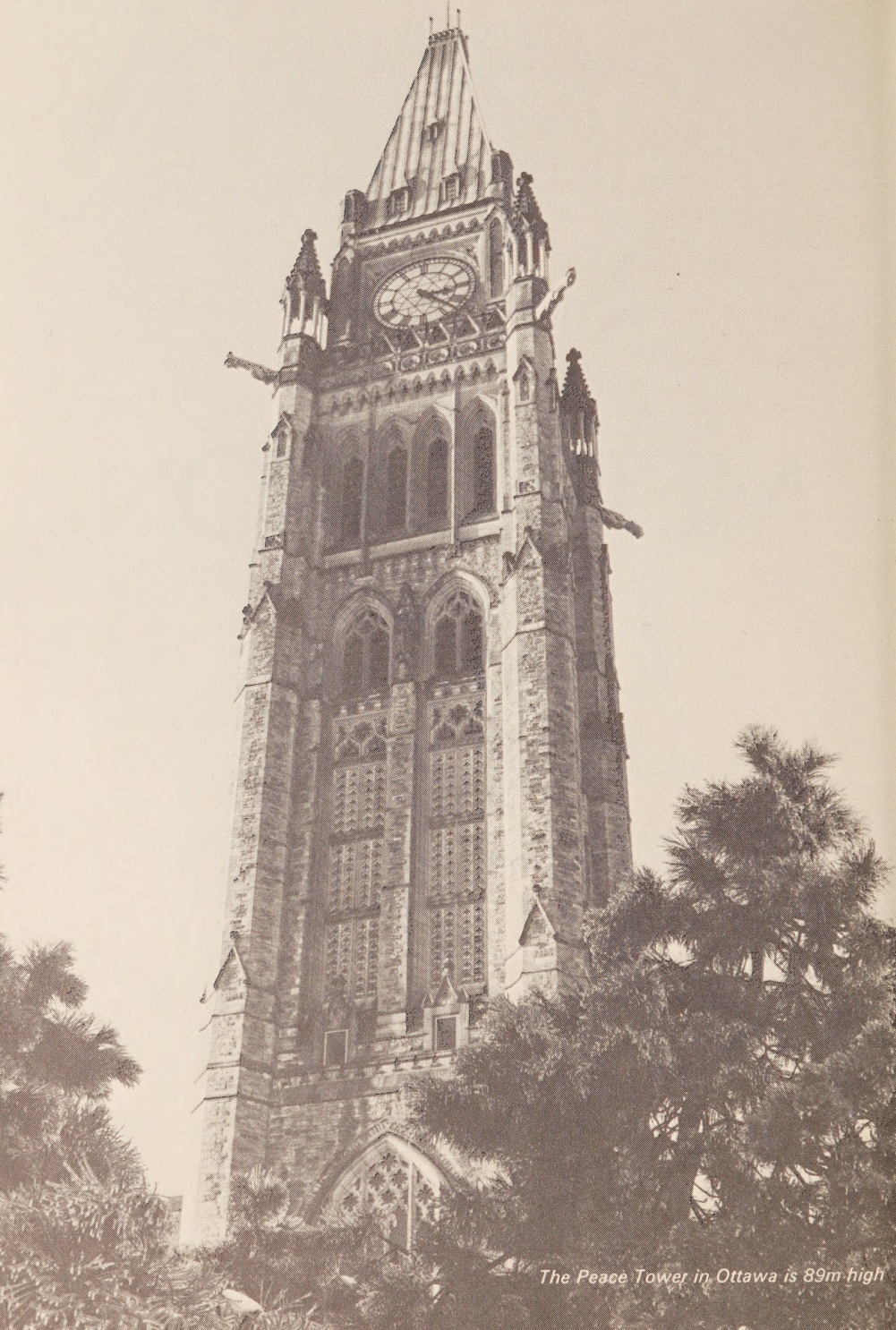


The Peace Tower in Ottawa is 89m high

DEFINITION: Metrication is a word coined to describe the process of introducing the metric system of weights and measures.

How did it all start? When man first appreciated the concept of measuring, he made a great step forward. It is generally believed that the original systems of measurement were evolved in Babylonia and refined in Egypt some five thousand years ago, following the development of a numerical system. This original Sumerian system was partly decimal (i.e. based on 10) and partly sexagesimal (i.e. based on 6) and is still used today in the measurement of angles (360° in a circle) and time (60 seconds = 1 minute, 60 minutes = 1 hour). The earliest units of length were based on human dimensions: for example, the Biblical cubit is the length of a man's forearm and the Egyptian digit the width of a finger. Units of mass and volume for ordinary commodities were not developed until much later although a primitive Egyptian balance for weighing precious metals has been found and was dated back to 3000 B.C.

Early units of mass were the same as the units of money and the British use of the word "pound" for both perpetuates this. The Romans laid the basis of European measurement systems by formalizing the Sumerian/Egyptian systems. They divided the basic units of the **pes** (foot) and the **libra** (pound) into twelve parts called **unciae** (which were later anglicized into inches and ounces respectively). The Romans also laid down standard measures for capacity (**amphora**) and volume (**modius**).

With the break-up of European civilization in the Middle Ages, the development of measurement systems on the European continent becomes less clear, although England had established national standards by the fifteenth century. Local standards were developed in Europe from a combination of Roman, Celtic, Germanic, Arabic and Barbarian influences. This led to considerable confusion, even at a time when travel was infinitely harder than it is today. Gradually some improvements were made, but there was relatively little change up to the seventeenth century.

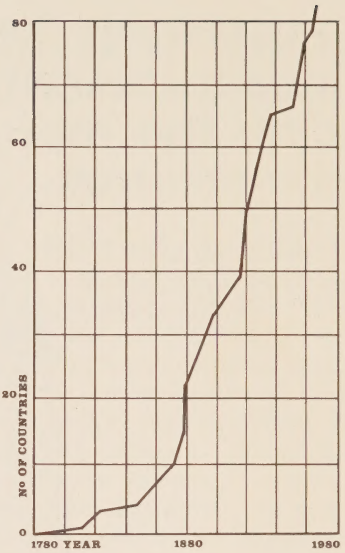
The development of science and mathematics at that time led to dissatisfaction among the leaders of the scientific movement with the existing chaos in measurement. They wanted a coherent system based on 10. Various ideas were suggested, but the political opportunity for the introduction of this logical system did not occur until the French Revolution in 1789. The revolutionary government hoped to "deduce an invariable standard for all measures and all weights" in collaboration with the British government. But the latter was in no mood to collaborate with the French at that time and the opportunity

for a universal world-wide system was lost. England, after all, had had national standards for some 300 years and saw no reason to change. The French decided to act alone and on January 1, 1840, all weights and measures other than those of the metric system became illegal in France.

By the end of the nineteenth century, the legality of the metric system had been recognized by most countries. In Canada, An Act respecting Weights and Measures passed in 1873 provided: "Notwithstanding anything contained in any Act or law now in force to the contrary, no contract or dealing shall be deemed invalid or open to objection, on the ground that the weights or measures expressed or referred to in such contract or dealing are weights or measures of the Metric System . . ."

The rapidly increasing use of the metric system in the twentieth century has now reached a point where some 90 per cent of the world's population lives in metric countries and an estimated 60 per cent of the world's gross national product is produced in them. In 1965, Great Britain declared its intention of going metric; Australia, New Zealand and Canada have followed. The United States (which has presently conducted a major investigation into the advisability of changing) looks as though it may be the last major country to work in inches, pounds and gallons; and even there, an eventual change is more than likely.

Why change? The necessity for a universal system of measurement has become more urgent with the increasing ease of transportation and communication, and the increasing volume of world-wide trade. Quite apart from the technical demands made upon us as producers or suppliers of goods and services in a sophisticated industrial society, we as consumers are confronted daily with numbers, weights and measures. Under these circumstances, it is a waste of resources to have to spend time on conversion factors and non-standard components. The benefits of a universal system are obvious and the only feasible world-wide system is the metric system.



The pace of metrication

But what of the cost?

The only certain thing that can be said about the cost of the change-over is that it will be greater the longer the change is postponed. (Most estimates put the increase at 8 per cent for each

year of postponement.) It can be argued that any work undertaken to measure the cost of metrication will, in fact, form a significant part of that cost. The aim of this booklet, however, is not to discuss the whys and wherefores of the decision to change — that decision has already been taken — but to look at what metrication will mean to Canadians and to Canadian consumers in particular.

What is the metric system? Some of the standard units of length, mass and capacity in the metric system are given in the table below, together with their approximate equivalents in the inch-pound system:

	metric unit	symbol	approx. equivalent
length	metre	m	39.37 in.
mass (or weight)	gram	g	0.035 oz.
capacity	litre	l	1.76 pt.

The real simplicity of the metric system comes when we examine the multiples and sub-multiples of the units. All units in the metric system have the same prefixes; the most common are:

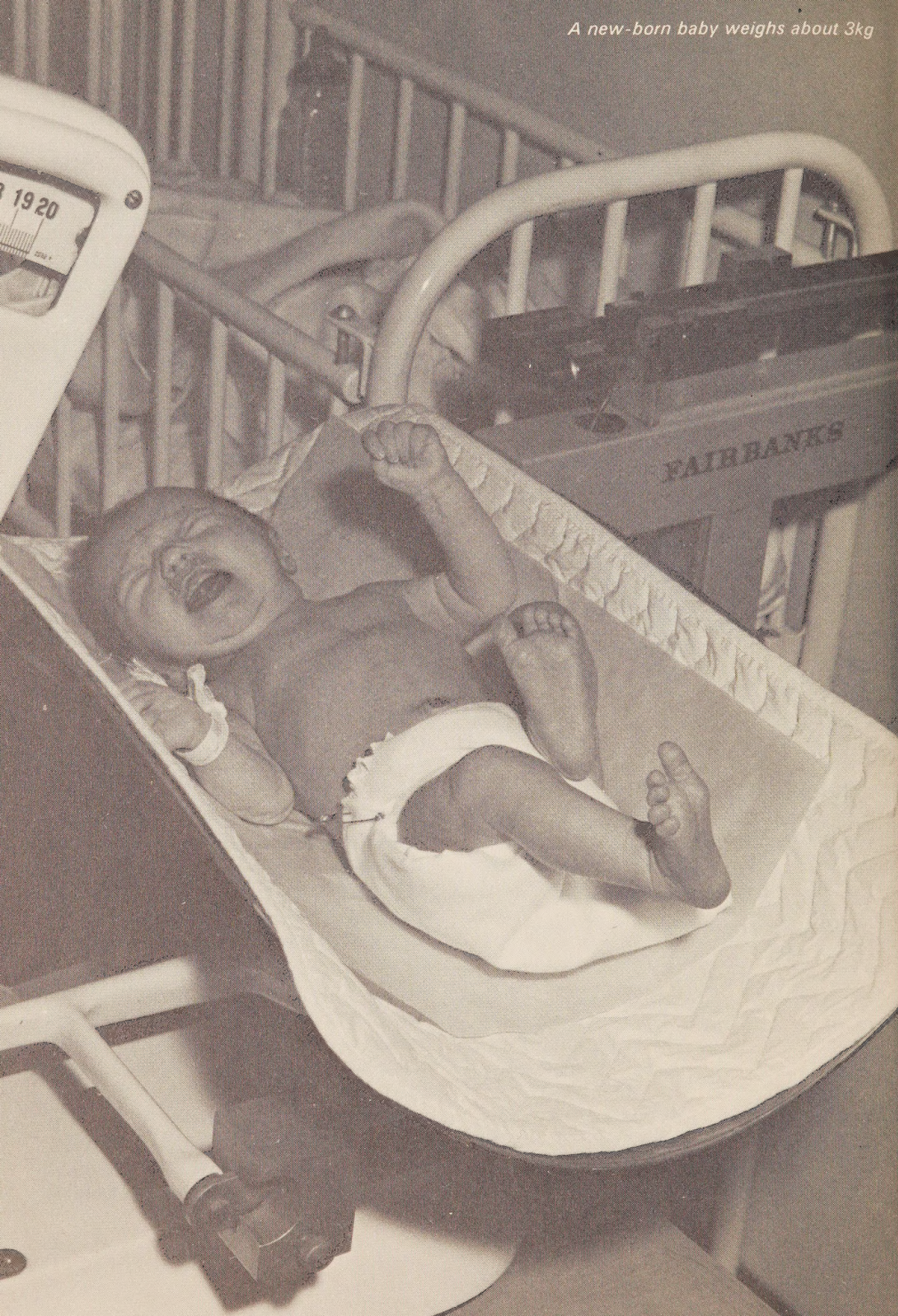
prefix	symbol	definition
mega	M	×1,000,000
kilo	k	×1,000
deci	d	÷10
centi	c	÷100
milli	m	÷1,000
micro	μ	÷1,000,000

Hence, a kilogram equals 1,000 grams (about 2.2 pounds) and a kilometre equals 1,000 metres; a millimetre equals 1/1,000th of a metre and a millilitre equals 1/1,000th of a litre. More exact measurements can be expressed simply by using a decimal point. For example, 1 kilogram 375 grams equals 1.375kg; or alternatively, it may be expressed as 1375g, in just the same way that $6.95 is equal to 695 cents.

In everyday activities, such as shopping, the most common units are likely to be the kilogram, the litre and the centimetre, although many purchases will involve metres, grams, millilitres and possibly centilitres.

When will the change take place? There can be no sudden, overnight transition to the metric system. It has to be a gradual process and for a modern industrialized country, ten years is about the minimum. This does not mean, however, that our weights and measures will be in continual confusion until well into the 1980's. Because the different sectors of the economy have their own problems in connection with the transition, a properly coordinated plan is the first essential.

There are two methods of organizing the basic strategy of the change — the retail end of the distribution chain either changes first or last. No decision has yet been taken for the Canadian change but there is a legal requirement embodied in the 1971 Consumer Packaging and Labelling Act that retail packages must carry quantity statements in both metric and inch-pound units, and the appearance of these packages in the stores will be the first general sign of the change. The decision was anticipated by new labelling requirements for hazardous household



A new-born baby weighs about 3kg

products under the Hazardous Products Act. Dual labelling in metric and inch-pound units for these products will begin to be generally used in 1972. A few manufacturers already do this and it is an interesting game to spot packages bearing statements of net contents in metric units in the supermarkets.

The **White Paper on Metric Conversion in Canada,** published by the federal government in January, 1970, did not set a deadline for the completion of conversion. One reason for this was the indefinite position of the United States with regard to metrication. If the United States decides to go metric in 1971, it is possible that the metric system will be the system in use in Canada by the 1980's.

What is happening in other countries? As has already been mentioned, Britain took the decision to go metric in 1965 and planned on ten years for the conversion. At the halfway point, there was little evidence that the general public was aware of this proposed change. Many labels of pre-packaged products on retail sale in Britain already have quantities marked in both metric and inch-pound units and there has been no specific government action to amend any laws controlling retail sales. But there has been much planning behind the scenes and transition schemes have been evolved for most of the major industries. Several major industrial sectors have already changed or are changing within the next year or so — paper and printing, construction, marine engineering, pharmaceuticals, and the entire engineering industry. The retail and consumer sector is being left to the last, partly because the change to decimal currency, which took place on February 15, 1971, is considered enough to occupy the British public at the present time. Nevertheless it is expected that the public will start to feel the impact in 1973 when it is planned to make many important changes. Metrication will progress rapidly from then towards a completion date of 1977 or 1978.

The position of the United States on the change is of considerable importance to Canada: indeed, many have expressed the opinion that it would be impossible for Canada to change unless the United States showed some official intention to change. The United States Metric Study examined the feasibility of conversion and presented the final report recommending metrication to

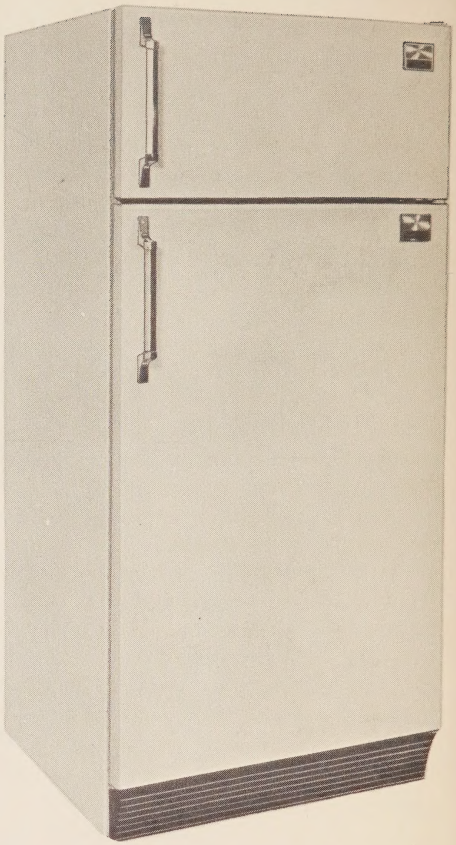
A personal size tube of toothpaste holds 25ml

Congress in August, 1971. The position of the United States in world trade could suffer, despite that country's vast wealth and commercial power, if the change to the metric system is not made. Conversely, the position of the United States could become stronger if the change is made. Many companies, particularly in the field of consumer goods, are now established on a world-wide basis and they would probably welcome moves towards standardization even though most of their national companies are given a fair degree of autonomy.

South Africa is well on the road to a complete change and Australia and New Zealand are in much the same position as Canada, having taken the decision.

How does one become familiar with metric units? The metric system is not a complete innovation to Canada or its inhabitants. A large proportion of first-generation immigrants have spent some of their lives with the metric system and will not take long to unlearn the inch-pound system. A further proportion of the population have taken science at school and, again, have a basic working knowledge of metric units.

The best way to become familiar with metric units is to start thinking in metric units. It is possible to obtain rulers, scales and measuring jugs calibrated in metric units and these can be used to measure the size of a book in centimetres, the depth of snow in metres, the weight of a ball in grams, the volume of a glass of milk in millilitres, your weight in kilograms, or your height in metres and centimetres. Other exercises to make you familiar with the metric system are to calculate the distance to the next town in kilometres, find out what the speed limits would be in km/hr, or work out the area of your garden in square metres. A few simple measuring and calculating exercises like these (and there are many, many more) should soon illustrate the simplicity of units in the metric system, although the numbers used will seem less familiar.



The volume of a refrigerator is about 0.4 cubic metres.

Will there be complicated conversion factors? A man is 5 ft. 10½ in. tall, or alternatively 179cm. Which is the easier to write? The expression "5 ft. 10½ in." uses five figures in two sizes, four letters, two periods and an oblique (or horizontal) line; "179cm" uses three figures (all the same size) and two letters. The only trouble is that most people can visualize a person's height as "5 ft. 10½ in." whereas "179cm" takes some getting used to. It is this visualization that is the basis of thinking metric. As long as you are occupied with conversion factors, you are not "thinking metric." Conversion factors (such as 1 inch = 2.54cm) should only be used when conversion is unavoidable.

Will package sizes be altered? For the vast majority of products the answer is "no." Only those whose quantity of sale is controlled by law will need to have their sizes altered. The size of some others may have to be changed, however, in order to contain a quantity which is a round number. All products will have to have the quantity marking in metric units. The changes that are likely in various groups of products are listed below.

Automobiles: Their specifications can be stated either in inches or in centimetres: it does not matter to the buyer whether, for example, the door width is measured in inches or centimetres. The buyer is concerned about spare parts if something goes wrong, but with frequent changes of design, this is already a considerable problem for mechanics. Metrication of measurements will not add appreciably to this load, but alterations in screw thread specifications would have more far-reaching effects. Replacement of the present multiplicity of screw threads by the metric standards for screw threads recommended by the International Organization for Standardization would help in the long-run but would only bring more confusion in the short-run. New sets of metric wrenches will be required apart from the double-stocking of parts. Ford and other major companies in the automotive industry are already committed to the manufacture of many important components in metric units, and such rationalization brings great economic benefits to inter-

A standard bottle of wine holds 750ml

A pool like this holds about 568,000 litres.

national companies. Automobile speedometers will need to be changed but some existing models could be converted by sticking a km/h scale over the existing m.p.h. one.

The engine capacity of automobiles is usually expressed in litres (or cc) in Europe. Britain adopted this approach many years ago, and it is now fully accepted there in motoring circles as a method of comparing engine sizes. (400 cu. in. equal approximately 6½ litres.)

Bakery products: All the provinces have laws controlling the sale of bread. Most of the permitted weights are selected from the following range: 12 oz., 16 oz., 20 oz., 24 oz., 36 oz., 40 oz., 48 oz., 60 oz. Approximate metric equivalents are 340g (= 12 oz.), 450g (= 15.9 oz.), 550g (= 19.4 oz.), 700g (= 24.7 oz.), 1kg (= 35.3 oz.), 1.1kg (= 38.8 oz.), 1.4kg (= 49.4 oz.) and 1.7kg (= 60 oz.). These are not very round figures and it would be better if a more rational range were chosen. For example: 375g, 500g, 750g, 1kg, 1.25kg, 1.5kg, and 1.75kg. This would make price comparisons easier as the weights would be in simple ratios with each other in much the same way as the existing ounce weights are. It would also mean that the common sizes of loaf such as 16 oz. and 24 oz. would become around 5-10 per cent larger.

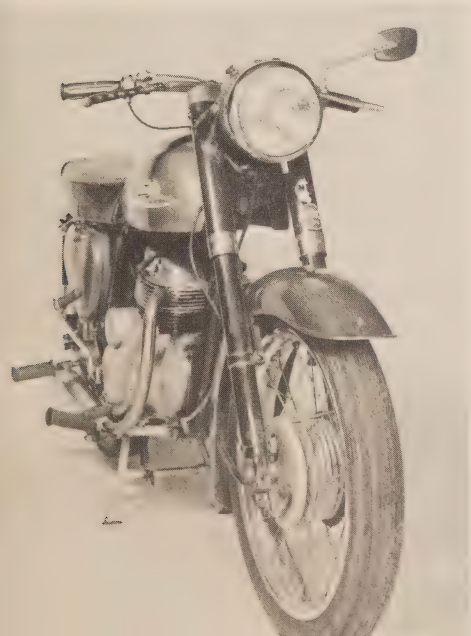
Clothing: Most ready-made clothing for women is sold by a size code number, e.g., size 12, size 16 etc. and there is no reason for this to change at all. It may be that the measurements specifying these sizes will be changed but this is of no direct concern to the

Good gas consumption is about 12 litres/100km

buyer for it is unlikely that the small changes would be noticed by the customer. Clothing that is bought made-to-measure need not be greatly affected either. If the tailor wants to use a centimetre tape instead of an inch one, that is up to him: whichever he uses, the final garment will be the same. Some items of clothing such as underwear and shirts are sold by actual measurement and the conversion of these will have a greater impact. It is likely that there will be a time of dual labelling, e.g., a shirt may be described by giving the neck size and sleeve length in both inches and centimetres. The most logical way of sizing children's clothes is by the physical measurements of the child. The Canada Standard Size system sponsored by the Department of Consumer and Corporate Affairs is based on this and is the most advanced in the world. If a code sizing is not used, there will probably be a period of dual labelling with the size markings given in inches and centimetres until people are used to thinking in metric units. Judging by British experience, this assimilation is a relatively easy one and it is surprising how soon parents become aware of their child's measurements (particularly height) in centimetres if they shop at stores which use dual labelling.

Dress-making patterns will soon be marked in both inches and centimetres. (Those that are exported directly to Europe already are.) In order to make a dress in centimetres, you will, of course, need a centimetre tape. Again, these should soon be available and making up clothes in metric units is

The engine capacities of motor-cycles are already measured in cc.



How will the CFL metricate football fields?

another valuable exercise in gaining experience of "thinking metric."

Dairy products: The quantities in which dairy products can be sold are strictly controlled by law. For liquid milk, the basic quantities are ½ pt., 1 pt., 1 qt., 2 qts. and 3 qts.; for butter, skim milk powder, processed cheese and dry whole milk: ¼ lb., ½ lb., 1 lb. and multiples of 1 lb.; and for ice-cream: ¼ pt., ½ pt., 1 pt. and multiples of 1 pint (less than 5 fl. oz. can be sold without restriction). The conversion of the capacity measures is likely to prove something of a problem. The logical metric equivalent to the pint is the half-litre (= 500ml); this is about 12 per cent less than the Canadian pint (but some 6 per cent more than the U.S. pint). Dairies are reluctant to change to a new unit smaller than the existing one because of a fear that sales will fall. Over half the liquid milk sold is in 3 qt. containers and 3 qts. equals 3.41 litres. It is unlikely that an additional 2.7 per cent could be accommodated in the existing returnable containers to make 3½ litre packs, and to put only 3 litres in would be uneconomic and possibly unhygienic. The 3 quart returnable container is gradually being replaced by non-returnable containers such as cartons or "Pitcher Paks." The machinery for filling these is more adaptable to different sizes and it could be that a 4 litre Pitcher Pak will become as usual as the 3 quart is now.

The logical conversion for the solid products is to 125g, 250g, 500g and multiples of ½kg. This means that metric packs would be about 10 per cent heavier than the present ones. Such a difference would not inconvenience consumers providing the packs were labelled to be clearly distinguishable during the period of change.

Footwear: The present system for sizing footwear was, believe it or not, originally based on the length of the foot in barleycorns. It is not a universal system and the increase of world trade has meant that there is an increasing variety of size markings in Canadian shoe shops. Admittedly, the only true way of fitting shoes is to try them on, but it does help to have consistent size markings. "Mondopoint" is a shoe sizing system based on the length of the foot in millimetres and this will gradually be introduced internationally from 1972. It is a voluntary system and the pace of introduction is entirely dependent on its acceptance by manufacturers and retailers. As an example, a size 8 will be called a 260 or a 265. The present half-size difference is 1/6th inch and this will probably be increased to 5 or 6mm (1/6th inch = 4.2mm).

Fresh fruit, vegetables and meat: The sale of fresh fruit, vegetables and meat when displayed loose is likely to be one of the most difficult transitions for the consumer. At present, prices are displayed as x cents per pound and customers either choose their produce and the sales clerk weighs and prices it, or they actually ask the sales clerk for some specified quantity which is then weighed and priced. Either way, the customers consciously use a system of measurement in making purchase decisions. This does not necessarily happen when they buy pre-packaged

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The photograph of Canova's 'Dancer' is reproduced by permission of the National Gallery of Canada, Ottawa.

food. After metrication, the shop would display the price as y cents per kg and the customers may well think that the price has more than doubled, unless the difference is clearly marked.

Stores will need to have their scales converted and further confusion could arise if some shops in a locality are converted and others are not. It will not be possible to convert overnight all the scales in Canada and one solution might be to convert them zone by zone. This might be done on the basis of relatively small geographical areas and this scheme would reduce the number of mechanics needed solely for conversion work and, hence, the expense of training them.

Many weighing machines can be converted quite simply (some are already sold with dual scales) but there are some types, particularly the more complicated ones used by large supermarkets for wrapping, pricing and labelling, that cannot be converted economically. The life of a machine of this type, if it is used intensively, is estimated at less than eight years and so the cost factor would not be intolerably heavy if the machine had to be scrapped after, say, five years.

There is no point in converting the sale of fresh produce until the consumer is thoroughly familiar with metric units; for this reason, this sector is likely to be among the last to go metric.

Some fruit and vegetables are still sold by volume measure, e.g., 1 pint of mushrooms or 6 qts. of apples. As there is no real equivalent to this in the metric system (litres and millilitres should only be used for liquids, and cubic centimetres are too small), it is likely that all fruit and vegetables will be sold by weight or number after metrication. Larger volume measures such as bushels may be expressed as a proportion of a cubic metre. Ten bushels is equivalent to about one-third of a cubic metre, or more precisely, 0.35 cubic metres.

Furnishings: The measurements of most items of furniture are not critical. Providing a chesterfield is not too long for a wall or a small table not too high for a windowsill, the buyer is not interested in exact measurements. It is unlikely that he will be given them unless he specifically requests them and then they may involve fractions of inches. It will be just as easy to have these in centimetres.

Carpets and drapes are two furnishings where actual measurement is important. Carpets may be wall-to-wall, in which case the buyer does not specify a length, but the seller charges by the yard. After metrication, he will measure the room in metres and centimetres and sell the carpet by the metre.

Many people make up their own curtains from material and this, like fresh produce, is a particular area of difficulty. What about the woman who has measured her windows in feet and inches going to buy material from a shop selling by the metre? The shop

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A dozen large eggs weighs about 680g

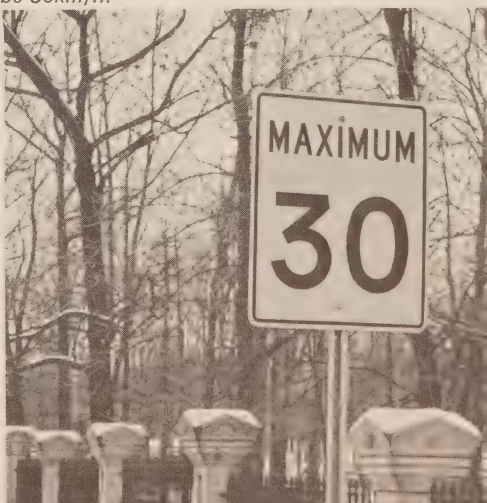
will have to be prepared with conversion tables or lose a sale. Free metric tape measures might be offered as an incentive.

Metric beds are likely to be a little longer than present ones. The regular length is now 6′ 3″ (75″) and this is likely to be increased to 2 metres (nearly 79″). The usual width for twin beds is likely to be virtually unchanged at 39″ (1 metre = 39.4″) but double beds may increase from 54″ to 1½ metres (59″). The present sizes of beds became standard about fifty years ago and since then, the average height of people has increased considerably so the slight increases are not undesirable.

Bedding is something of a problem because it is expensive to change the machinery and most sheets and blankets are sold for beds already in use. However, the variety of actual sizes (as opposed to size markings) available will enable a gradual change to be made to metric sizes without much more inconvenience to the consumer than at present. Dual marking will be an advantage for these items and it is to be hoped that bedding manufacturers will do this as soon as metric beds are available in the shops.

Gasoline and oil: Pumps dispensing gasoline or oil are relatively easily converted to measuring in litres. Fortunately, the habit of buying gasoline by the dollar's-worth (and not by the number of gallons) is usual and a dollar's-worth in litres is the same quantity as a dollar's-worth in gallons. The price per unit will be different and those cheap offers will look even cheaper when they are expressed as the price per litre. For example, 45 cents per gallon equals 9.9 cents per litre. Metrication of the sale of gasoline throughout North America will end the present confusion between Imperial and U.S. gallons and end those arguments about gasoline consumption. In Europe, this is usually expressed as litres per 100km and hence a car with a low figure is more economical. 10 litres per 100km = 28.2 m.p.g.; 15 litres per 100km = 18.8 m.p.g.

The speed limits in urban areas will probably be 50km/h.



The measurement of time will not change

Groceries: Pre-packaged groceries will probably be the first products to show evidence of metrication. In most cases, the package will be unchanged except for the addition of a metric weight marking. The intention of this dual labelling is to give the customer an idea of the magnitude of metric units, but this might leave an unfortunate impression in some cases. For example, a product that is now packed as 1 lb. could show the metric equivalent, 453.6g. A consumer confronted with this could react by saying, "What is the good of changing from a simple '1 lb.' to an untidy 453.6 grams?" It should be emphasized that the complicated metric weight is just a stepping stone to round metric numbers. If a pack is made up in a round metric quantity, then it is reasonable that, for a time at least, the Imperial equivalent should be added, e.g., 1kg (2 lb. 3.2 oz.). If it is not intended to change the size of pack at all, it could be labelled 14 oz. (400g), changing later to 400g (14 oz.).

Among pre-packed foods, some canned and frozen foods must be sold, by law, in certain quantities. The sizes of can used for fruits and vegetables are laid down in the Canada Agricultural Products Standards Act and of the twenty-one sizes, there are five that are the most common. The can sizes are specified in sixteenths of an inch and there is no necessity to change these sizes, although their specifications might be expressed in mm. For example, a 19 oz. can measures 3 7/16" x 4 9/16", which would translate to 87mm x 116 mm if expressed to the nearest mm. (1mm = 1/25 inch approximately.)

The stated contents of cans are at present in fluid ounces. Future international recommendations may be for weight marking, but this is no problem if the volume is expressed in metric units and the product is about the same density as water — as is the case with most canned fruits and vegetables. A 14 fl. oz. can would become 400ml on metrication, and 400g if weight marking was subsequently required. 14 fl. oz. happens to convert very easily to a round metric figure — the exact conversion of 14 fl. oz. is 397.74ml. Some of the other common can sizes do not convert as easily, but it is possible to relabel all of them in reasonably round metric figures within 5 per cent of the present stated amounts.

Although the quantity marking will change, the quantity inside will **not.** At present, the actual quantity may exceed the stated quantity by up to 4 per cent

A Boeing 747 weighs 322 metric tons and cruises at 1000km/h. at an altitude of 10,000m.

and the stated quantity should always be regarded as a minimum. The cans will remain the same size holding the same quantity — the only change will be the label.

Some frozen foods also have to be sold in certain specified weights. It is not too difficult to change the size of these packs if the difference is small and it is possible to convert most of them to round metric figures within 10 per cent of present weights. The largest (2 lb.) packs might be increased in weight to 1kg.

For canned fruits, there are legal standards for drained weight but it would not be difficult to convert these to metric weights. Again, the product itself and the actual quantity in the pack would be quite unchanged.

Other common groceries such as sugar, tea and instant coffee will probably be sold in appropriate weights from the series 75g, 125g, 250g, 500g, 1kg and multiples of 1kg.

Hardware and lumber: This is another area where actual measurements are frequently used. About half of the items sold in hardware shops directly involve some measurement — a one-inch screw, a door panel, a half-gallon of paint, all imply some measurement — and some situation where the bought item must fit.

In the case of paint, new standard-sized cans will probably be developed and, if Canada follows the British pattern, the change will be to a series of 100ml, 250ml, 500ml, 1 litre, 2.5 litre, 5 litre and 10 litre cans (1 gallon equals approximately 4½ litres). The metric equivalents of the familiar one-half

Letter rates may be in 25g steps

gallon and gallon cans will be about 10 per cent larger than at present.

Nails and screws will probably be a little shorter than the present, particularly for sizes longer than 1 inch. One inch = 25.4mm so the logical replacement for an inch screw is a 25mm one. Similarly, the equivalent of a 4 inch nail will be a 100mm (or 10cm) one. This is some 1.6 per cent (or about 1/16th inch) shorter — barely noticeable.

Panelling, which at present usually comes in 4′ x 8′ sheets, may well standardize on 2.5m x 1.25m (8′ 2″ x 4′ 1″). For this type of product, it is advisable that the new standard should be slightly larger and it can then be cut or planed down to fit the old. If the new standard is smaller, the reverse process may not be possible.

The sale of lumber in metric units depends on the development of new standard sizes. The length is generally requested by the customer but the other

dimensions are selected from a number of standard sizes such as 2 x 4, etc. (The customer could ask for 2 metres now, but he would certainly get some peculiar looks, and if the store had no metric measure, he would have to be satisfied with an equivalent in feet and inches.) Lumber imported into Britain has been supplied in metric sizes since April, 1970 and Canadian suppliers have had to make some changes in their paper-work procedures but, for the most part, the metric standards are compatible with the traditional Canadian designations of lumber sizes.

Household equipment: Household equipment such as refrigerators or cooking stoves will not be affected by metrication. Any small changes that are necessary will not be noticed in the general trend of changing designs to accommodate new models. The only critical measurement in buying a new appliance is whether it will fit in the space available for it. This problem already exists and will not be substantially altered by metrication. It may be necessary to get used to measuring refrigerator capacity in litres instead of cubic feet but, in any case, neither method is particularly accurate for expressing the real size of the appliance.

Land and maps: With large distances measured in kilometres and smaller distances in metres, land measurements and some maps will show considerable changes after metrication. Land area, measured in acres now, will be measured in hectares but it is anticipated that the traditional subdivisions of land measures in Canada will change slowly, if at all. The basic unit of area in the SI* is the "are," which equals 100 square metres, but this will probably be discouraged because of confusion with the word "acre"; 1 hectare (100 ares) is slightly less than 2½ acres. The scaling of maps will be made much easier. Most scales now are expressed in two ways, e.g., 1 :8,870,400 or 140 miles to 1 inch; after metrication, only one will be necessary, e.g., 1 :5,000,000 which means that one unit of length on the map represents 5,000,000 on the ground. This could be expressed as 1cm represents 50km. This would be for a map covering a very large area (such as the whole of Canada). More usual road map scales would be 1 :250,000 (1cm represents 2½km or nearly 4 miles to 1 inch) or 1 :1,000,000 (1cm represents 10km or 16 miles to 1 inch).

Liquor: Bottles of liquor or wine are usually in standard sizes, typically 25 or 26 fl. oz. or 40 fl. oz. The regular wine or liquor bottle is quite close to ¾ litre (or 750ml). The larger bottle is not so easily converted to a round metric quantity since 40 fl. oz. = 1.15 litres However, this may be a suitable conversion as the actual measure of the bottle is relatively unimportant provided that it is a standard size for all brands. Domestic beer, now commonly sold in 12 fl. oz. bottles, can be simply relabelled to read 340ml as, again, the size is standard.

Paper: Writing paper comes in many sizes, but for office use the most usual sizes are quarto and foolscap, which are not in particularly round measure-

**This refers to the "Système International d'unités," a coherent system of measurement developed by the General Conference of Weights and Measures.*

This box-car has a volume of about 108 cubic metres.

ments at present. (E.g., foolscap measures 8 in. x 13 in.) Some years ago, a new international paper size was developed in metric units. The most used size of these is A4, which measures 210mm x 297mm (when trimmed). A smaller size (A5) measuring 148mm x 210mm can be used for short letters. Each size of the series has the advantage that it is half the size of the previous one and, hence, fewer envelope sizes are necessary.

Photographic equipment: Many people who own cameras, particularly movie cameras, are already used to metric measurements. Amateur movie film is described as 8mm or 16mm according to the width, and a popular width for still film is 35mm. The chemicals used in developing and printing are still sold mostly in ounces, etc. in North America although they are sold and measured in metric units everywhere else in the world. This is likely to be one of the areas keenest to adopt metric units.

Postage rates: Postage rates are an area where government decisions and the general public meet face to face. In order to promote the adoption of the metric system, it is likely that there will be an early move to put postal tariffs on a metric basis. At present, it costs so many cents to send a letter that weighs less than one ounce and an additional amount for each additional ounce. 1oz. = 28.35g, and so the choice has to be made whether the increments should be in 25g or 30g steps. In the former case, it will be equivalent to an increase for heavier letters, although most letters would still go for the minimum charge. Parcel post rates (based on 1 lb. increments) might be altered to ½kg increments but, again, some adjustments in rates at the higher levels might be necessary. The maximum weight for international parcels (22 lb.) is already, in fact, metric (22 lb. = 10kg).

Toiletries and drugs: Some toiletries are already marked in metric units. Toothpaste is an example where one brand has the weight only in grams and others are in ounces. This is perfectly legal but it does make shopping confusing. In addition, the majority of existing weights are given in eighths, or even sixteenths, of an ounce and, without a slide rule, price comparisons are practically impossible anyway. It is hoped that round metric measurements will be introduced in early 1972, but the removal of the fractions will be a slight help. Other toiletries and drugs are almost always labelled in ounces but many (if not all) are prepared in metric units. The research expenditure necessary to market a new product means that manufacturers are organized on a world-wide basis and, more than most, they are keen to get to a universal system of measurement. From the consumers' point of view, there will be little or no difference in the size of metric toiletries and similar products.

Weather: The outside air temperature is a most important factor in our lives. When a complete metric system is adopted in Canada, temperatures will be measured in degrees Celsius (known as Centigrade in some countries). Water freezes at 0 degrees Celsius and boils at 100 degrees Celsius, which is easier to remember

than 32 degrees Fahrenheit and 212 degrees Fahrenheit. However, because there are only 100 degrees between freezing and boiling as against 180 degrees on the Fahrenheit scale, the accuracy of a temperature quoted in whole degrees is much less. This is probably not important in everyday life where the difference between, say, 38°F. and 39°F. is trivial. What will be more of a problem will be getting used to new standards. For example, 30 degrees on the Fahrenheit scale is on the chilly side, but on the Celsius scale, it is distinctly warm (= 86°F.). At this level, the differences are too great to be confusing but around the 0°F. mark (= −18°C.), there are possibilities for confusion. The transition from Fahrenheit to Celsius in Britain was started less than ten years ago and is still far from complete. This is partly because of the policy of giving both temperatures which conditioned people to mentally switch-off for the one they didn't understand. A much shorter transition period could probably have been achieved by omitting the Fahrenheit temperature statement at an early stage.

Meteorologists already have some charts in metric units and this is another area where world-wide standardization has tangible advantages. Other aspects of weather measurement that might be metricated are wind speed (to km/h, which will increase the precision) and barometric pressure. The units to be used for the latter are still in some doubt. In countries using the metric system now, the bar (and millibar) are in common use (1 bar = 29.53 in., more usually expressed in millibars, so that the regular barometric pressure is about 1013mb).

What problems will there be? Probably very few. It is clear from the list of products that, providing the transition period is well planned and kept as short as possible, there will not be many problems for consumers. What problems and difficulties there are will be ones of transition and it is worth repeating that these can be minimized by "thinking metric."

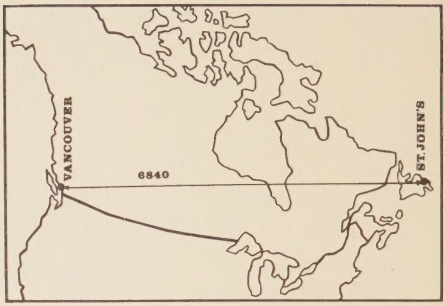
What is "thinking metric"? Whenever we come into contact with weights and measures, we either use measuring instruments or we use some imaginary standard measure. For most of us, the imaginary standard measures are in round inch-pound units but it doesn't take long to replace them with metric ones. For example, if you were asked to judge the length of a piece of lumber, you would mentally compare its length with some other standard of length that is well known to you, possibly a person's height or a yardstick. We all have a set of these imaginary standards in our minds but what they are and in what units they are expressed is dependent on our cultural and educational background. Most Canadians will instinctively think in feet, pounds and pints, but Europeans would equally instinctively think in metres, kilograms and litres. The change to thinking in metric units is not difficult but does require some conscious effort

On a hot day the temperature is in the thirties (Celsius)

at first. In a way, it is like learning a new language — the more you use it, the better your standard of achievement — but it is easier than a language because there are so few 'words'

What about the schools? Mathematics will seem far simpler to a metric generation. The time now spent on learning the various complicated conversion factors can be spent with the more interesting aspects of mathematics. Also, it is possible to teach parents through their children. This is already being done in British schools where only the metric system is now being taught to the first grades. These children will inevitably bring home metric standards. If they are asked "How big is this?", they will answer in grams or centimetres and not in ounces or inches. School-children are an important part of the program — they stand to gain most, but only if the teachers and education authorities are aware of the benefits of metrication.

What other advantages will there be? Most people who have lived with both systems at different times in their lives prefer the simplicity of the metric system. Anybody who visited or lived in Britain before the decimalization of the currency appreciates the greater ease of dealing in dollars and cents and there are similar advantages in decimal weights and measures. Whether we like it or not, computers will play an increasingly large role in our lives in the coming years and the programming of conversion factors is not only wasteful in



The distance from St. John's to Vancouver is 6840km

effort, but also contributes to the possibilities of errors. The conversion to metric weights and measures should reduce the chances of error and perhaps bring some economies.

The transition can also be used to gain a number of benefits in standardization and rationalization. Every manufacturer and distributor should take the opportunity to examine his range of products and to question whether the sizes that are presently on the market are really the ones that consumers want. There may be too many sizes; a reduction in the number would bring economies in production. Packages may be too small, and if the size is to be changed, metrication is the ideal occasion to rectify this. Metrication should not mean just adding markings in grams or millilitres to the present label: it should involve an examination of the whole production and marketing process in order to achieve greater efficiency for the producer and greater satisfaction for the consumer. Only in this way will all the advantages of metrication be gained.

Some everyday metric units

Quantity	Unit	Symbol
length	millimetre (one thousandth of a metre)	mm
	centimetre (one hundredth of a metre)	cm
	metre	m
	kilometre (one thousand metres)	km
area	square centimetre	cm^2
	square metre	m^2
	hectare (ten thousand square metres)	ha
volume and capacity	cubic centimetre	cm^3 (or c.c. or cc)
	cubic metre	m^3
	millilitre (one thousandth of a litre)	ml
	centilitre (one hundredth of a litre)	cl
	litre	l (or litre)
mass (or weight)	gram (one thousandth of a kilogram)	g
	kilogram	kg
	tonne (one thousand kilograms)	t (or tonne)
time	second	s
	minute	min
	hour	h
speed	metres per second	m/s
	kilometres per hour	km/h
	knots (international nautical miles per hour)	kn

Consumer and Corporate Affairs

Consommation et Corporations